

AMENDMENTS TO THE CLAIMS

1. (Original) A method of inspecting a liquid crystal display device using an inspection apparatus, the inspection apparatus including a light source, at least one inspection line and at least one inspection switch device connected to the inspection line, the method comprising:

providing a substrate, wherein the substrate includes a plurality of signal wirings, a plurality of drive switches, and a plurality of capacitors formed in an effective display area of the substrate;

radiating a light generated from the light source of the inspection apparatus onto the at least one inspection switch device and thereby supplying an inspection voltage from the at least one inspection line to a corresponding one of the drive switches through the signal wirings, so as to charge a corresponding one of the capacitors; and

determining if there is a defect in the effective display area of the substrate by reading the charged voltage of the corresponding one of the capacitors.

2. (Original) The method according to claim 1, wherein the determining step includes: comparing the charged voltage of the corresponding one of the capacitors with a predetermined reference voltage.

3. (Original) The method according to claim 1, wherein the signal wirings include a plurality of gate lines, the at least one inspection switch device includes first and second

inspection switch devices, and the at least one inspection line includes first and second inspection lines, and

wherein the radiating step includes:

radiating a light from the light source onto the first inspection switch device to turn on the first inspection switch device; and

turning on the second inspection switch device under control of the first inspection switch device and thereby supplying a first inspecting voltage from the first inspection line to a corresponding one of the gate lines, so as to turn on the corresponding one of the driving switches.

4. (Original) The method according to claim 3, wherein the signal wirings further include a plurality of data lines, and the at least one inspection switch device further includes third and fourth inspection switch devices, and

wherein the radiating step further includes:

radiating a light onto the third inspection switch device to turn on the third inspection switch device; and

turning on the fourth inspection switch device under control of the third inspection switch device and thereby supplying a second inspection voltage from the second inspection line to a corresponding one of the data lines, so as to charge the corresponding one of the capacitors.

5. (Original) The method according to 4, wherein the determining step includes:
radiating a light onto the first and third inspection switch devices; and

reading the charged voltage of the corresponding one of the capacitors, to thereby determine if there is a defect in at least one of the signal wirings, the driving switch devices and the capacitors.

6. (Original) The method according to claim 1, wherein the inspection apparatus is formed on the substrate as part of the substrate.

7. (Original) The method according to claim 1, further comprising:
informing a user of the determination result in real time.

8. (Currently Amended) A method of inspecting a substrate device, the substrate device including signal wirings, drive switches and capacitors formed in a main area of the substrate device, and an inspection line and an inspection switch formed at an exterior of the main area, the drive switches being coupled to the capacitors, the inspection switch being coupled to the inspection line, the method comprising:

supplying an inspection voltage to the inspection line of the substrate device;
charging one of the capacitors with the inspection voltage through the signal wirings; and
determining if there is a defect in the substrate device by reading the charged voltage of the capacitor,

wherein the charging step includes:

turning on a corresponding one of the drive switches; and

radiating a light onto the inspection switch to turn on the inspection switch, so as to charge the one of the capacitors.

9. (Original) The method according to claim 8, wherein the determining step includes:
comparing the charged voltage of the capacitor with a predetermined reference voltage;
and
determining whether or not there is a defect in one of the signal wirings, a corresponding one of the drive switches, or the charged capacitor based on the comparison result.

10. (Cancelled)

11. (Original) The method according to claim 8, further comprising:
severing, from the substrate device, the inspection line and the inspection switch formed at the exterior of the main area of the substrate device after an inspection of the main area is completed.

12. (Original) The method according to claim 8, further comprising:
covering, with a light cut-off layer, the inspection line and the inspection switch formed at the exterior of the main area of the substrate device after an inspection of the main area is completed.

13-16. (Canceled)

17. (Original) An inspection apparatus for a liquid crystal display device, the liquid crystal device including a plurality of signal wirings, a plurality of driving switch devices and a plurality of capacitors formed on a substrate and formed in an effective display area of the liquid crystal display device, the apparatus comprising:

at least one inspection line formed at an exterior of the effective display area of the liquid crystal display device;

at least one inspection switch device connected to the at least one inspection line and formed at an exterior of the effective display area;

a light source to radiate light onto the at least one inspection switch device, so as to turn on the at least one inspection switch device and to charge an inspection voltage from the at least one inspection line onto one of the capacitors; and

a control part to read the charged voltage of the one of the capacitors and thereby determine if there is a defect in the effective display area of the liquid crystal display device.

18. (Original) The apparatus according to claim 17, wherein the at least one inspection switch device includes:

a first transistor to be turned on in response to the light from the light source; and

a second transistor to be turned on in response to an output voltage of the first transistor.

19. (Original) The apparatus according to claim 18, wherein the at least one inspection line includes:

a first inspection line to which a gate-off voltage lower than a threshold voltage of the first transistor is supplied and a gate terminal of the first transistor is connected; and

a second inspection line to which a gate-on voltage higher than a threshold voltage of the second transistor is supplied and a source terminal of each of the first and second transistors is connected.

20. (Original) The apparatus according to claim 19, wherein the signal wirings include:

a gate line connected to the second transistor; and

a plurality of data lines crossing with the gate line.

21. (Original) The apparatus according to claim 20, wherein a drain terminal of the first transistor is connected to a gate terminal of the second transistor and a drain terminal of the second transistor is connected to the gate line.

22. (Original) The apparatus according to claim 18, further comprising:

a capacitor connected between a drain terminal of the first transistor and a gate terminal of the second transistor to stabilize a gate voltage of the second transistor.

23. (Original) The apparatus according to claim 17, wherein the at least one inspection switch device includes:

a third transistor to be turned on in response to the light from the light source; and
a fourth transistor to be turned on in response to an output voltage of the third transistor.

24. (Original) The apparatus according to claim 23, wherein the at least one inspection line includes:

a first inspection line to which a gate-off voltage lower than a threshold voltage of the third transistor is supplied and a gate terminal of the third transistor is connected;

a second inspection line to which a gate-on voltage higher than a threshold voltage of the fourth transistor is supplied and a source terminal of the third transistor is connected; and

a third inspection line through which the charged voltage of the one of the capacitors is transmitted after the inspection voltage is applied and to which a source terminal of the fourth transistor is connected.

25. (Original) The apparatus according to claim 24, wherein the signal wirings include:

a data line connected to the forth transistor; and

a plurality of gate lines crossing the data line.

26. (Original) The apparatus according to claim 25, wherein a drain terminal of the third transistor is connected to a gate terminal of the fourth transistor and a drain terminal of the fourth transistor is connected to the data line.

27. (Original) The apparatus according to claim 23, further comprising:

a capacitor connected between a drain terminal of the third transistor and a gate terminal of the fourth transistor to stabilize a gate voltage of the fourth transistor.

28. (Original) The apparatus according to claim 17, further comprising:

a light cutting-off layer to shield the at least one inspection switch device and the at least one inspection line from light.

29. (Original) An apparatus for inspecting a substrate of a liquid crystal display device, the substrate including a plurality of signal wirings, a plurality of drive switches and a plurality of capacitors formed in an effective display area of the substrate, the apparatus comprising:

a light source to radiate light;

at least one inspection line formed at an exterior of the effective display area of the substrate;

at least one inspection switch device connected to the at least one inspection line and formed at an exterior of the effective display area of the substrate, wherein the at least one inspection switch device is radiated with the light from the light source so as to be turned on to supply an inspection voltage of the at least one inspection line to a corresponding one of the drive switches, whereby a corresponding one of the capacitors is charged through the signal wirings; and

a determining part to determine if there is a defect in the effective display area of the substrate by reading the charged voltage of the corresponding one of the capacitors.

30. (Original) The apparatus according to claim 29, wherein the determining part compares the charged voltage of the corresponding one of the capacitors with a predetermined reference voltage to make the determination.

31. (Original) The apparatus according to claim 29, wherein the wiring signals include a plurality of gate lines, the at least one inspection line includes first and second inspection lines, and the at least one inspection switch device includes first and second inspection switch devices.

32. (Original) The apparatus according to claim 31, wherein the first inspection switch device is turned on in response to the light from the light source, the second inspection switch device is turned on under control of the first inspection switch device to supply a first inspecting voltage from the first inspection line to a corresponding one of the gate lines, which turns on the corresponding one of the drive switches.

33. (Original) The apparatus according to claim 32, wherein the wiring signals further include a plurality of data lines and the at least one inspection switch device further includes third and fourth inspection switch devices, and

wherein a light from the light source is radiated onto the third inspection switch device to control the third inspection switch device, the fourth inspection switch device is turned on under

control of the third inspection switch device to supply a second inspection voltage from the second inspection line to a corresponding one of the data lines so as to charge the corresponding one of the capacitors.

34. (Original) The apparatus according to 33, wherein a light from the light source is radiated onto the first and third inspection switch devices, and the determining part determines if there is a defect in at least one of the signal wirings, the drive switches and the capacitors based on the charged voltage of the one of the capacitors.

35. (Original) The apparatus according to claim 29, wherein the apparatus is part of the substrate.

36. (Original) The apparatus according to claim 29, further comprising:
means for informing a user of the determination result in real time.

37-40. (Canceled)

41. (New) An inspection apparatus for a liquid crystal display device, the liquid crystal device including a plurality of driving switch devices and a plurality of capacitors formed on a substrate and formed in an effective display area of the liquid crystal display device, the apparatus comprising:

at least one inspection line formed at an exterior of the effective display area of the liquid crystal display device;

at least one inspection switch device connected to the at least one inspection line and formed at an exterior of the effective display area, wherein the at least one inspection switch device is selectively turned on to charge an inspection voltage from the at least one inspection line onto one of the capacitors; and

a control part to read the charged voltage of the one of the capacitors and thereby determine if there is a defect in the effective display area of the liquid crystal display device,

wherein the at least one inspection switch device includes:

a first transistor, and

a second transistor to be turned on in response to an output voltage of the first transistor; and

wherein the at least one inspection line includes:

a first inspection line to which a gate-off voltage lower than a threshold voltage of the first transistor is supplied and a gate terminal of the first transistor is connected, and

a second inspection line to which a gate-on voltage higher than a threshold voltage of the second transistor is supplied and a source terminal of each of the first and second transistors is connected.

42. (New) The apparatus according to claim 41, further comprising:

a capacitor connected between a drain terminal of the first transistor and a gate terminal of the second transistor to stabilize a gate voltage of the second transistor.

43. (New) The apparatus according to claim 41, wherein the liquid crystal device further includes a gate line connected to the second transistor and a plurality of data lines crossing with the gate line, such that a drain terminal of the first transistor is connected to a gate terminal of the second transistor and a drain terminal of the second transistor is connected to the gate line.

44. (New) An inspection apparatus for a liquid crystal display device, the liquid crystal device including a plurality of driving switch devices and a plurality of capacitors formed on a substrate and formed in an effective display area of the liquid crystal display device, the apparatus comprising:

at least one inspection line formed at an exterior of the effective display area of the liquid crystal display device;

at least one inspection switch device connected to the at least one inspection line and formed at an exterior of the effective display area, wherein the at least one inspection switch device is selectively turned on to charge an inspection voltage from the at least one inspection line onto one of the capacitors; and

a control part to read the charged voltage of the one of the capacitors and thereby determine if there is a defect in the effective display area of the liquid crystal display device,

wherein the at least one inspection switch device includes:

a first transistor, and

a second transistor to be turned on in response to an output voltage of the first transistor; and

wherein the at least one inspection line includes:

a first inspection line to which a gate-off voltage lower than a threshold voltage of the first transistor is supplied and a gate terminal of the first transistor is connected,

a second inspection line to which a gate-on voltage higher than a threshold voltage of the second transistor is supplied and a source terminal of the first transistor is connected, and

a third inspection line through which the charged voltage of the one of the capacitors is transmitted after the inspection voltage is applied and to which a source terminal of the second transistor is connected.

45. (New) The apparatus according to claim 44, further comprising:

a capacitor connected between a drain terminal of the first transistor and a gate terminal of the second transistor to stabilize a gate voltage of the second transistor.

46. (New) The apparatus according to claim 44, wherein the liquid crystal device includes a data line connected to the second transistor, and a plurality of gate lines crossing the data line, such that wherein a drain terminal of the first transistor is connected to a gate terminal of the second transistor and a drain terminal of the second transistor is connected to the data line.

47. (New) The method according to claim 8, wherein the substrate device is a liquid crystal display device.